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ABSTRACT

This study examined the ability of junior high school students to use advance information when making semantic category decisions. The subjects, eight good readers and eight poor readers, identified paired words as "same" or "different" in category, with some words more highly associated with the category than others--in the "fruit" category, for example, "apple" is higher in value than "kumquat." Advance information (the name of the category) was presented either aurally or visually in half the trials. A comparison of subjects' reaction times with the reaction times of a college-student control group indicated that junior high school students are still developing their semantic memory networks and that good readers are apparently farther along in this development: the good readers in the study benefited from advance information, especially in the auditory mode, whereas the poor readers showed less semantic ability, even with the highly identifiable words, and did not benefit from advance information. The study concludes that this evidence may indicate why poor readers experience greater difficulty with the more complex semantic tasks of reading. (RL)

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Perceptual Versus Semantic Information Processing in Semantic Category Decisions

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Background and Rationale

Rosch (1975) has developed a paradigm for examing the use of advance information in making semantic category decisions. Two features of this paradigm are worth discussing in detail. First, Rosch has developed a set of norms for "level-of-goodness" for the semantic categories she uses. That is, each category is represented by exemplars which have been rated on the basis of how well they fit the categories. For example, in the category 'FRUIT', 'apple' is a high level-of-goodness exemplar while 'kumquat' is a low level-of-goodness exemplar. The level-of-goodness norms seem to be stable and reliable as indicated both by Rosch's work and that of Childrey and Kamil (1977).

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Second, Rosch uses a decision task which incorporates advanced information, known as "priming". The decision task is to make "same category" or "different category" judgments for pairs of exemplars from the categories. On half of the trials, advanced information is provided in the form of the name of a category relevant to the word pair. One the remainder of the trials, no priming information is provided, in which case the test pair is preceded by the word 'BLANK' instead of a category name. Three types of word pairs are included, physically identical pairs, categorically identical pairs, and different category pairs. Physically identical trials contain the same word, repeated, for example, 'Apple ** Apple'. Categorically identical pairs have two different words taken from the same category, for example, 'Apple ** Orange'. Different pairs have two different words taken from different categories, at the same approximate level-of-goodness, for example, 'Car ** Apple'. Subjects respond "same" to both physcially identical and categorically identical pairs by pressing one key and "different" to the different category pairs by pressing another key. The dependent measure was reaction time to press the correct key.

The sequence of events on each trial was the following: 1) A category name (prime) or the word 'Blank' was presented followed by, 2) a blank interval of 2.0 sec when, 3) the pair of words was presented visually until, 4) the subject made a "same" or "different" response by pressing the appropriate key. After the trial, 5) the subject was given informative feedback before proceeding to the next trial.

In the present study, stimuli were presented on a cathode ray tube display controlled by an ADS 1800E computer. Reaction times to make decisions were measured and recorded automatically.

Rosch found that level-of-goodness was related to latency of decision for categorically identical pairs with high level-of-goodness producing faster RTs. Priming also produced faster RTs for categorically identical pairs. However, when the pairs were physically identical, priming interacted with level-of-goodness. These results are shown in Figure 1.

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Insert Fig. 1 about here

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The explanation Rosch applied to these results was that subjects generated some "aspect of meaning" on primed trials. This perceptually-based aspect of meaning uniformly facilitated processing of primed categorically identical pairs as a function of level of goodness. For physically identical pairs, the interaction occurs because the perceptual representation is more like good examplars (facilitating decisions) than poor exemplars (inhibiting decisions). This combination of facilitation and inhibition results in the interaction in Figure 1.

Hanson and Kamil (1977) attempted to replicate the Rosch study. They found differences in processing of physically identical pairs, dependent on the modality in which advanced information was presented. In the original Rosch study, primes were presented auditorily. When primes were presented visually in the Hanson and Kamil study, the interaction for physically identical pairs was not obtained. These results

are given in Figure 2.

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Insert Fig. 2 about here

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Auditory presentation of primes was also used by Hanson and Kamil. These results are shown in Figure 3. These data are an apparent repli-

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Insert Fig. 3 about here

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cation of the Rosch findings, with the major difference being the attenuated interaction for physcially identical pairs.

Hanson and Kamil have interpreted their findings as further support for the generation of perceptual expectancy in making semantic category decisions. This expectancy is disrupted by the use of visual advanced information. Hence visual priming results in no interaction for physically identical pairs. In either modality, the priming advantage is maintained for semantic (categorically identical) decisions. This indicates that these semantic effects are "automatic". In contrast, the perceptual effects observed for physically identical pairs are easily disrupted. These and other data collected by Hanson and Kamil suggest that the perceptual effects are based on strategies which subjects adopt to facilitate processing.

Because the Rosch task allows the separation of semantic and perceptual processes, it is a useful tool to examine processes in reading.

Experimental Design

Sixteen junior high school students participated in the study. Eight were selected from remedial reading classes and eight were selected from non-remedial English classes. All students were paid for participation in the experiment.

The independent variables in the normal Rosch paradigm are: 1) Type of trial (physically identical, categorically identical, or different); 2) Level-of-goodness (high, medium or low); and 3) Advanced information (primed or unprimed). In this study, modality of advanced information (visual or auditory) was also manipulated. Finally, reading ability (good or poor) was another variable. In all cases, the dependent variable is latency of decision.

Experimental sessions lasted about one hour. Each participant received 196 trials, half primed and half "blank", equally divided between "same" and "different".

Results

All data were subjected to repeated measures analyses of variance. Where appropriate, quasi F-ratios were constructed. In the interest of readability, the precise F values have been omitted. In all cases, α was 0.05 or smaller.

Figure 4 shows the results for college students, good junior high school readers, and poor junior high school readers. College students

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Insert Fig. 4 about here

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show a level-of-goodness effect in all conditions. Good readers also show a level-of-goodness effect in all conditions except in the physically identical trials with visual primes. Poor readers show no level-of-goodness effects in any conditions.

For the categorically identical trials, college students show priming advantages. Good readers show priming advantage only when the priming information is auditory. Poor readers do not show any advantage of priming information.

For the physically identical trials, college students show an interaction between priming and level-of-goodness for auditory information. Neither good nor poor readers show the interaction effect.

Finally, college students are faster than junior high school students, and good readers are faster than poor readers.

Discussion

These results reveal some interesting "developmental" trends over the range of students tested. Examination of Figure 4 makes these trends most apparent.

Within the interpretive framework of semantic (automatic) and perceptual (strategy) effects, college students and good readers show similarities for semantic effects in both auditory and visual conditions. This suggests that both of these groups have developed a well-

organized semantic memory network which is reflected by level-of-goodness norms and decision latencies. Of the two modality conditions, however, the auditory condition is easier for good readers and the results for this group match college students more closely. On physically identical trials, the auditory condition shows good readers developing the necessary level-of-goodness effect. However, they do not seem to differentiate their perceptual strategy for primed and unprimed trials to yield the physcially identical interaction.

Poor readers show neither the perceptual nor semantic effects. This would indicate that the general trend of development is first to establish a stable semantic structure and, later, (by college level) perceptual effects of this semantic structure. The poor readers, however, did show reaction times which were very slow compared to good readers and slower for visual primes than the easier, auditory primes.

Junior high school students are still developing the category structure (in terms of level-of-goodness) found in college students. Good readers are apparently farther along in this development that are poor readers. Good readers seem to be better than poor readers at using advanced information to make predictions and adopt differential strategies. Perceptual affects seem to be developing in both good and poor readers. Again, good readers seem to be farther along in this development.

While the Rosch task used in this study does not involve the entire spectrum of reading skills, it does isolate and examine two skills

important in reading: semantic and perceptual processing. Poor readers have difficulty with relatively simple semantic tasks. It would be expected that they would have even more difficulty with the more complex semantic tasks in reading. Similarly poor readers have more difficulty than good readers in the perceptual aspects of the task. It may be that even junior high school students still need development of their perceptual processing strategies. Additional work will be needed to determine 1) whether these findings are true when larger units (than words) are used and 2) whether these differences found between good and poor readers can be remediated by conventional methods.

References

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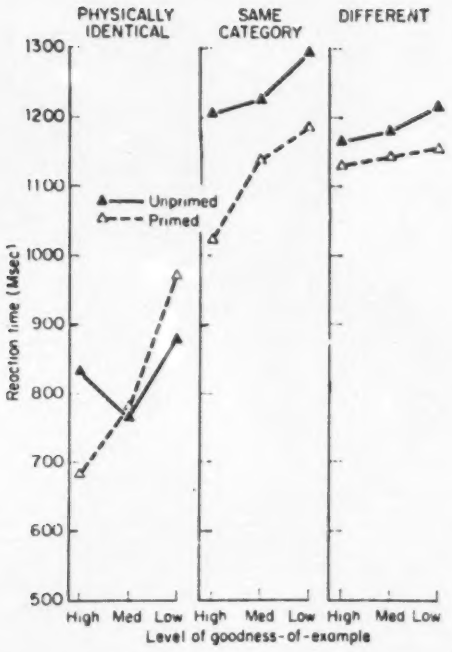

FIGURE 1. Two-sec prime interval, same-category instructions.

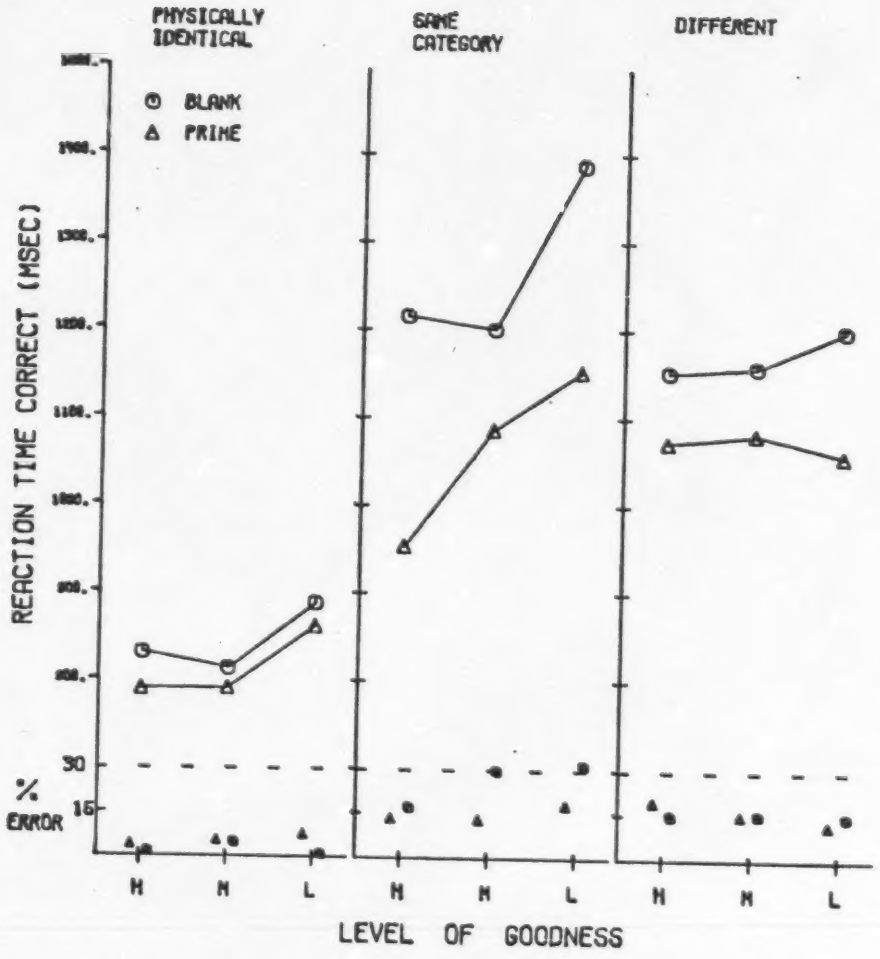

Figure 2. Visual prime, alternating prime order, 2.5 sec prime-pair ISI.

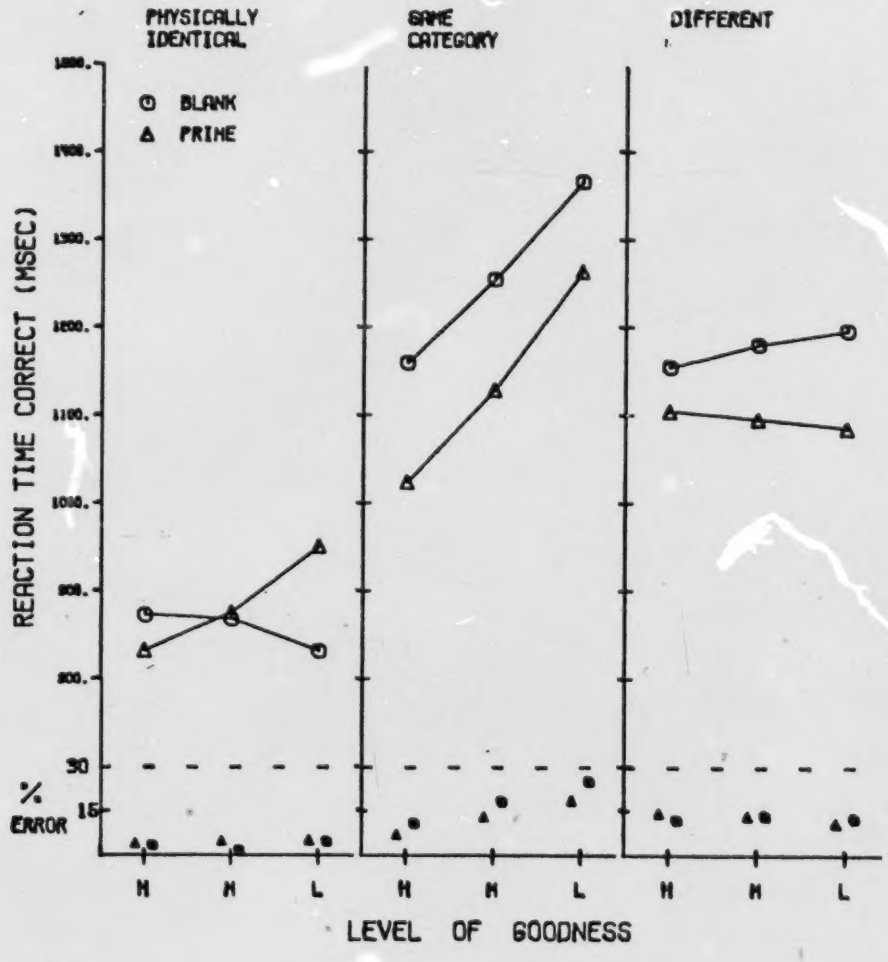

Figure 3. Auditory prime, alternating prime order, 2.5 sec prime-pair ISI.

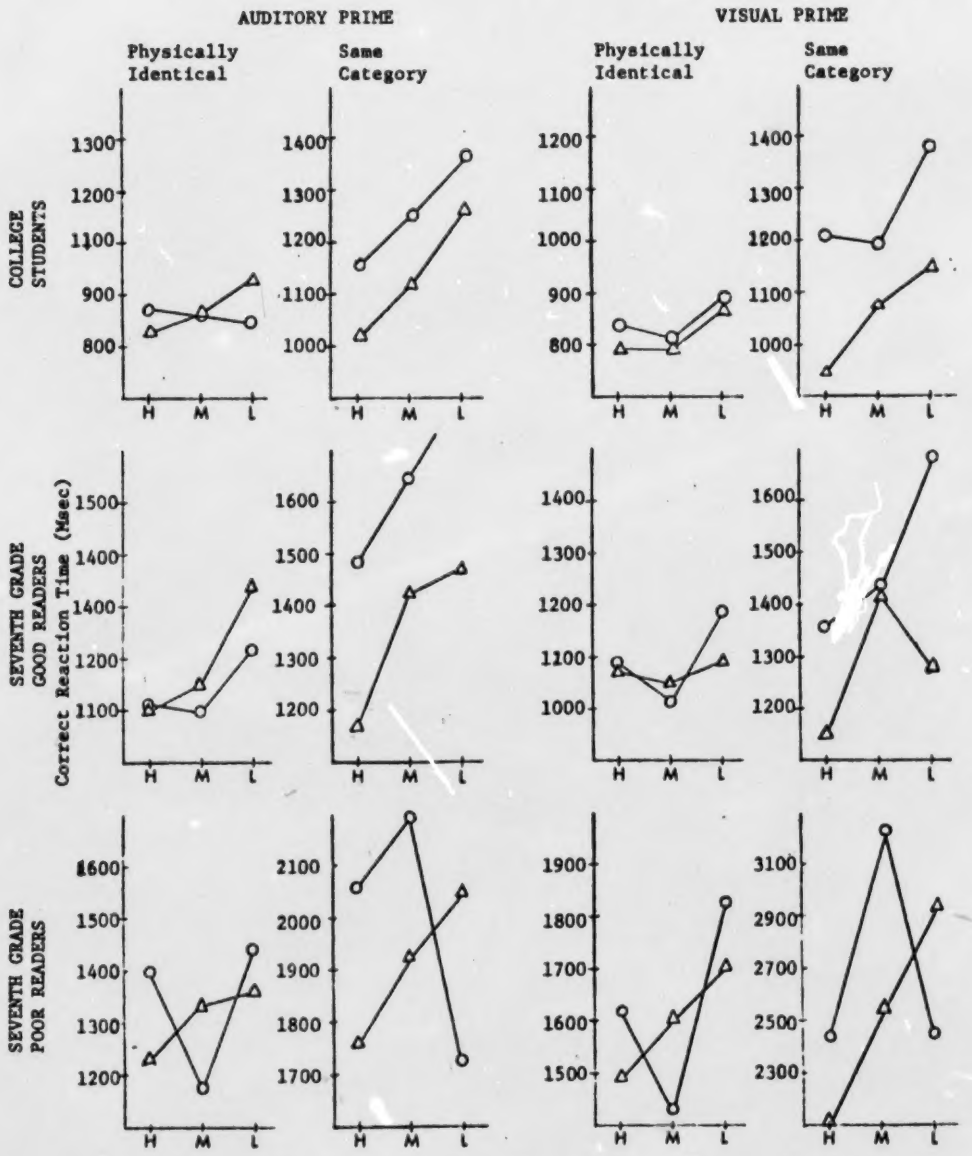

Figure 4. Summary graphs for all conditions in study. Note that reaction time scale for visual-poor readers is half scale.